ONTARIO WATER RESOURCES COMMISSION

Kawartha Lakes water management study.

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KAWARTHA LAKES

WATER MANAGEMENT STUDY

ECOLOGICAL PHILOSOPHY OF AQUATIC WEED HARVESTING

Biology Branch
Division of Laboratories
Ontario Water Resources Commission
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KAWARTHA LAKES WATER MANAGEMENT STUDY

ECOLOGICAL PHILOSOPHY OF AQUATIC WEED HARVESTING

INTRODUCTION

It has long been recognized by biologists and scientists that a number of Ontario's relatively shallow, recreational lakes systems such as the Kawartha Lakes are affected by a type of pollution scientifically known as eutrophication or aquatic enrichment. Characteristics of such lakes include the production of extreme numbers of algae and weeds which develop in response to high concentrations of nutrients in the water.

It must be stressed that all lakes are subject to inputs of dissolved mineral substances and resulting sedimentation - specifically substances such as phosphates, nitrates, carbonates and numerous trace elements - increases which occur as a result of precipitation, land runoff and percolation of soil-water to the lake basin. Such inputs augment the fertility of the system, contributing to a natural process of eutrophication. The Kawartha Lakes are extremely productive owing to the fertile soils drained and/or flooded by the creation of the Trent Canal System. These lakes are generally more turbid than Precambrian country lakes owing to the increased phytoplankton production and presence of suspended particulate matter. They support substantial beds of submerged plants such

such as water milfoil, elodea, coontail and pondweeds and produce excellent yields of warm-water game fish species such as walleye, bass and maskinonge. However, increased enrichment attributable to agricultural runoff, urbanization along the system and the inadequate containment of cottage wastes are presently contributing to, and will continue to increase the stresses on an already productive environment.

In many of the Kawartha and Rideau lakes, artificial nutrient inputs have increased the production of blue-green algal "water-blooms" and aquatic plants to the point where many activities such as swimming, water skiing and unimpeded boating are practically impossible. Prolonged periods of hot, calm weather have periodically caused decomposition of algae and aquatic plants in stagnant or isolated bays, resulting in dissolved oxygen depletions and accompanying fish mortalities. Also, periodic winter kills of fish resulting from organic decomposition from weed and algal depositions have been a recurring problem.

FORMS OF ALGAE AND WEED CONTROL

There are currently two basic methods which may be employed for weed control - chemical or mechanical.

Chemical control

Chemical control of weeds can be accomplished following issuance of a permit under Section 38 of the Ontario Water Resources

Commission Act. The effectiveness of various herbicides and algicides on both target and non-target plants, as well as regulation of the permits are currently assessed by personnel of the Biology Branch, OWRC.

One major disadvantage of chemical control is that a potentially toxic material is introduced into the aquatic environment. In a few isolated instances, excess chemicals have been inadvertently added. On such occasions the short-term effects have been undesirable as aquatic life forms other than weeds and algae have been temporarily eradicated. Of greater significance is that the long-term or residual effects are often not fully understood.

Secondly, chemically-destroyed plants remain in the water where they decompose to release stored nutrients for support of new growth. Additionally, dissolved oxygen depletions resulting from decomposition may undermine the suitability of the aquatic environment for desirable fish species.

Mechanical control

Mechanical control measures usually consist of cutting the plants and collecting the cuttings with either an aquatic harvester or later, in a secondary operation. Removal of the cuttings is essential to avoid nuisances caused by large quantities of drifting and decomposing plants.

Although cost and expediency appear to favour chemical methods, mechanical control or harvesting is considered ecolog-

ically more sound. Initially, mechanical removal will not introduce toxicants into the water. Secondly, actual removal of nutrient materials from the lake cycle will result. Recent data from Chemung Lake suggests that nitrogen and phosphorus drains as high as 50 and 6 pounds per acre respectively can be removed per cutting. However, absolute yields will vary from season to season, lake to lake and species to species. Thirdly, mechanical removal if properly carried out will not alter the plant and animal life balances as drastically as chemical treatments, and may in fact, enhance the fisheries of a lake. Finally, mechanical removal provides immediate relief from prolific weed growths.

EFFORTS re: WATER MANAGEMENT

In 1971 scientists of the OWRC, the Department of Lands and Forests and co-operating universities began a study of the Kawartha Lakes system between Balsam Lake and the Bay of Quinte. The broad objective is to develop a sound water management plan to optimize water use potential. As such, the study will take cognizance of all human, social and economic factors which influence the pattern of water resource utilization throughout the system.

As part of the study, the Commission is considering the possibility of removing excessive weed growths with aquatic weed harvesters to improve the potential of a lake to support activities such as swimming, boating, water skiing and yachting.

As indicated earlier, it is also possible that such a harvesting programme would create a "nutrient-drain" by the repetitive cropping and removal of plant materials from overly-enriched waters. However, before moving too far in this direction it is imperative to determine what effects weed harvesting will have on the fisheries of a lake. It is entirely possible that large areas of aquatic plants may be removed without damaging fish production and also, that a specific pattern of cutting may actually enhance the fishery. On the other hand, adverse effects might result.

Biologists of the Department of Lands and Forests and the OWRC are currently carrying out intensive studies on lakes Chemung and Katchiwanooka to assess fish populations and associated fish-food organisms in both weedy and adjacent cleared areas, as well as evaluating angling success prior to possible experimental harvesting throughout a significant portion of the lake.

FATE OF REMOVED VEGETATION

From a more practical point of view, any programme aimed at improving environmental quality should be evaluated with a view to ensuring that the solution to one problem does not directly or indirectly give use to a problem in a second direction. Thus, one must seriously question the ultimate fate of aquatic vegetation once harvesting and removal have been accomplished. For example, the simplest removal technique, of course, would

be to dispose of the material in an area of waste land or swamp close to the lake or river. Transportation cost would be negligible in this case; however, following decomposition it would only be a matter of time before the nutrients released from the plants would percolate into the water to provide raw material for yet another crop. Returning the nutrients to agricultural land is undoubtedly a good approach but, if the vegetation must be transported long distances to suitable farm land, thus consuming large amounts of energy and adding to the congestion on highways, then the benefits are considerably reduced. Aside from this, the nutrient value of aquatic plants is small when compared to commercially available fertilizers and the material would only be a partial substitute for inorganic compounds.

Suggestions currently under consideration for re-cycling the harvested crop, include various types of soil additives and animal feeds. Also, a good deal of interest involving the use of the aquatic plants for paper processing has recently been expressed. However, before a weed harvesting operation and associated re-cycling project can be effected on a large scale, it is absolutely essential to demonstrate the ecological and practical merits on a pilot-plant basis to governmental personnel and the public.

SUMMARY

The benefits to the aquatic resource from mechanical weed removal have yet to be determined, but we are confident that in many areas where severe congestion is resulting from the proliferation of rooted plants, such methods may provide the only long-term solution to enhancing the multi-purpose potential of our waterways. This possibility must surely be considered when the decision is made to use, or not to use, harvested vegetation for a particular purpose. Any process which will re-cycle raw materials and thereby reduce the quantity of "waste material" within our environment must indeed be attractive in an era when constant "disposal" techniques threaten to overwhelm us.

The entire question of ensuring the best use of Ontario's waterways is extremely complex. The basic need is not one of simply controlling various types of pollution - rather, it is one of defining what is desirable in terms of water resource utilization and then implementing whatever remedial or protective measures are in keeping with sound water management principles.

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